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ABSTRACT

The nature of the cognitive representations and processes involved in vocabulary learning has received little attention in the psycholinguistics and second language literature. This paper addresses the problem by proposing a model of the second-language Mental Lexicon (ML2) and the processes that construct it, as an extension of the model of the L1 Mental Lexicon (ML1) developed in Hall (1992). In this view, the Mental Lexicon is conceived as a submodule of the language faculty, serving comprehension and production as part of a Fodorian 'input' and output' system (Fodor, 1983). It is hypothesized that the ML2 is 'parasitic' on the ML1, with not separate existence: learners automatically seek to incorporate L2 lexical input into the existing ML1 framework, directed by a 'parasitic strategy' that ensures the simplest connections between L1 and L2 representations. (Contains 35 references.) (JP)

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Making the Right Connections:

Vocabulary Learning and the Mental Lexicon[1]

> The reader can ask himself ... whether he thinks that the kind of knowledge [of language] we have and use every day could really be learned or if understanding language is like opening one's eyes and seeing. For language we must open our ears, make connections between words and things, and adjust our grammars in some slight ways. The rest may be all there. Making 'slight adjustments' and a few 'connections between words and things' can be taken to refer to the special characteristics of each language. Such operations seem monumental to those in language classes or to tourists trying to make themselves understood in a foreign country, but they may actually be quite minimal. It is like noticing that human beings all look quite different from each other; but, in many respects, we all look exactly the same.
>
> Edward Matthei & Thomas Roeper (1983) Understanding and Producing Speech, London: Fontana

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ABSTRACT

The nature of the cognitive representations and processes involved in vocabulary learning has received very little attention in the psycholinguistics and second language literature. This paper begins to address the problem by proposing a model of the L2 Mental Lexicon (ML2) and the processes which construct it, as an extension of the model of the L1 Mental Lexicon (ML1) developed in Hall (1992). In this view, the Mental Lexicon is conceived as a sub-module of the language faculty, serving comprehension and production as part of a Fodorian 'input' and 'output' system (Fodor, 1983). On the basis of evidence from transfer errors deriving from learners' automatic assumption of equivalence with associated L1 forms, and from general cognitive principles, it is hypothesised that the ML2 is 'parasitic' on the ML1, with no separate existence: learners automatically seek to incorporate L2 lexical input into the existing ML1 framework, directed by a 'parasitic strategy' which ensures the simplest connections between L1 and L2 representations. The model is consistent with both modular and connectionist views of the human mind, and the adoption of this cognitive perspective strongly suggests a reassessment of current pedagogical uneasiness about the use of L1 in the language classroom.

0. Introduction

After a long period in the academic wilderness (cf. Meara, 1980), the problem of vocabulary has recently acquired a more prominent place in second language research. Recent treatments (e.g. Gairns & Redman, 1986; Carter & McCarthy, 1988; Nation, 1990) have explored the problem largely from the pedagogical point of view; little has been done, however, to explore the cognitive events involved (cf. Chanell, 1988 for an exception). This is rather surprising given the central importance of the lexicon in recent work in cognitive science, from the perspectives of both theoretical linguistics (c.f. Chomsky, 1986; Bresnan, 1982) and psycholinguistics (c.f. Frauenfelder and Tyler, 1987; Marslen-Wilson, 1989). Trends in 'L1 linguistics' tend to be taken up quite rapidly in work on L2, but in this case, given the central role played by vocabulary in the language learning process, the gap in the research was in need of filling independent of developments in the field of L1.[2]

This study attempts to begin filling the gap by presenting a model of vocabulary learning in a second language based on what we know about the organisation of the Mental Lexicon in the first language. The model described (which is an expansion of the L1 representation model developed in Hall, 1992) is exemplified through Spanish and English; its implementation in other languages will differ only in regard to the degree to which they share lexical cognates through genetic affiliation or borrowing. So far, the model deals only with morphologically simplex words, but work is currently underway to extend it to cover prefixed and suffixed words.

The primary goal of this research is to illuminate the cognitive processes involved in the learning of L2 vocabulary, with a view not only to providing some theoretical background for the elaboration of appropriate pedagogical strategies, but also to making a contribution to the ongoing development of an integrated cognitive science. It is for this reason that I frequently step outside the normal boundaries of L2 research and freely import findings from disciplines which have much to offer to L2 research, but are seldom exploited.

The organisation of this paper is as follows. Section 1 outlines some relevant features of the L1 Mental Lexicon and expands the representational model devised in Hall (1992). The fundamental distinctions between representation and process, form and content, and linguistic and non-linguistic information, are introduced and used to motivate the expanded model. In Section 2 the model is applied to the L2 domain, and arguments are given for the parasitic nature of the L2 Mental Lexicon. It is concluded that a Parasitic Strategy operates mandatorily in the vocabulary learning process. In Section 3 some potential pedagogical implications of the strategy are discussed.

1. The L1 Mental Lexicon

The L1 Mental Lexicon (henceforth ML1) is a component part, or module, of the human language system, which also includes modules dedicated to knowledge of syntax, phonology, morphology,[3] and (grammatical aspects of) semantics. Taken together, the information

represented in these modules constitutes the mentally represented grammar of an individual's language. It is this grammar which underlies the individual's ability to encode and decode linguistic expressions. The encoding and decoding functions are performed by processing mechanisms associated with each module. For the ML1, it is a word recognition and word selection mechanism, henceforth called the Lexical Processor.

In this section, we take a bird's eye view of the nature of the ML1, concentrating on three fundamental distinctions: (i) between the knowledge module (where lexical information is represented) and the processing module (where lexical information is encoded or decoded); (ii) between lexical form (the physical encoding of the word as a phonological or orthographic string) and lexical content (the word's syntactic, morphological and semantic characteristics); and (iii) between linguistic representations and processing (internal to the Mental Lexicon) on the one hand, and non-linguistic representations and processing (external to the Mental Lexicon) on the other.

1.1 Process and Representation

First, let us address the distinction between process and representation in the Mental Lexicon. Of these two, the former has received most attention in the psycholinguistics literature. And within the lexical processing literature, decoding (word recognition) has been explored in much greater depth than encoding (word selection). Accordingly, most of the discussion here will concern word recognition, although word selection will receive attention. Following Marslen-Wilson (1987), I start with the assumption

that word recognition encompasses the following functions: (i) access, establishing contact between the incoming sensory (acoustic or orthographic) information and the representations of candidate forms in the Mental Lexicon which match that information; (ii) selection, discriminating between the lexical entries contacted so that the best-fit candidate is isolated; and (iii) integration, establishing contact between the syntactic/semantic information in the representation of the isolated word and the higher levels of analysis required to understand the whole utterance of which the word is a part.

It is broadly assumed that the nature of the representation of information in the Mental Lexicon will reflect both these processing functions and also the implicit knowledge we have of words and word structure, as, for example, described by generative morphologists, and syntacticians working on the lexicon (cf. e.g. Radford, 1988: ch. 7; Jensen, 1990). It has been estimated (Aitchison, 1987) that an educated adult will have a native vocabulary of at least 50,000 words (and maybe as large as 250,000). The L1 speaker's 'lexical competence' clearly encompasses an extensive body of knowledge, a veritable word hord, as the author of Beowulf describes it, and if we take into account knowledge of the internal structure of words, i.e. of productive affixes, allomorphs etc., the richness of representations in the Mental Lexicon becomes even more amazing.

Whatever the characteristics of ML1 process and representation, it appears that they must be shared too by the L2 Mental Lexicon (henceforth ML2), when this has reached a sufficiently high level of sophistication, e.g. in a near-fluent L2 speaker. Research suggests that L2 speakers in an L1

school environment learn new vocabulary at similar rates as their native-speaking classmates (cf. Nation, 1990) and we have no reason to think, a priori, that the process of vocabulary learning will be drastically different for L1 and L2. The overall target of L2 learners is native grammatical competence, and some L2 speakers seem, at least superficially, to come very close to it. In the area of vocabulary, then, L2 learners are aiming for L1 lexical competence, i.e. at acquiring the richness of the ML1. Thus, a reasonable hypothesis is that the nature of representation in the ML2 is parallel to that of the ML1. It is this hypothesis that is pursued here.[4]

1.1.1 The Language Processor as Input System

Words take time to say and time to recognise, but this time is measured in milliseconds, rather than the seconds or even minutes taken to look up words in a printed dictionary. Spoken word recognition is incredibly fast and effortless, just like our negotiation of obstacles as we walk down a busy street: like the coordination of the muscles used in walking, the most important and remarkable features of spoken word recognition are the speed at which such a complex process occurs and our absolute unawareness of it. English speakers (more accurately, English listeners) hear on average two to three words a second, which makes this rapidity even more remarkable. This ease of comprehension takes on almost miraculous proportions when we consider the less than optimal conditions in which speech is received. Some examples: we live in a noise-filled world, and words get damaged or lost in the din ... we are in ever more frequent contact with speakers of other dialects (sometimes with strong regional or foreign accents), and the pronunciation of many words differs

from the pronunciation we know ... these days we seem always to be in a hurry, and rapid rates of speech lead to articulatory blurring, which has to be unpicked ... our attention is often tempted elsewhere, and we have to be kept to the task at hand ... finally, much of our talk is now conducted on the telephone, which completely filters out many of the cues which make normal word recognition a going concern.

None of these sources of environmental 'noise' represent unusual scenarios: they are the norm, and we are generally only superficially aware of them. This is because word recognition is an automatic process, which we have no more control over than we do over the circulation of our blood or the functioning of our kidneys. Word recognition conforms to all the diagnostics of genetically determined cognitive mechanisms and processes. It should be viewed as a constituent part of what Fodor (1983) has termed an 'input system' - a mechanism, like those used in seeing, smelling, tasting, etc., which serves to recover meaning from information encoded through sensory input. Common to all the input systems are their speed and automaticity, features which have evolved in the species because of the enormous selectional advantages they afford: imagine trying to escape a predator fast if we had to worry about consciously calculating its distance on the basis of stereoscopic images derived from retinal stimulation and then consciously working out our escape trajectory and instructing the relevant motor muscles! Just as these complex calculations are done for us by automatic cognitive processes, so words can be recognised without us having to consciously work through Marslen-Wilson's three stages of access, selection, and integration. Thus, the linguistic processing mechanisms

together with the mental grammar constitute an input system, just like the senses, and the ML1 is a modular component of this system.

1.1.2 Lexical Entries

The lexicon is unique amongst grammatical modules in that it contains information pertinent to all the other modules and yet little of its own; for example, although the syntax contains only syntactic knowledge, and the phonology only phonological knowledge, the lexicon contains both syntactic and phonological (as well as other types of) knowledge. Indeed, there is no such thing as purely lexical knowledge: it is, basically, other knowledge. The lexicon is the repository of all linguistic knowledge that is exceptional, that is not predictable from the rules and principles represented in the other modules. Some examples from the different modules should make this point clearer.

In the phonological module, general principles of the sound system are given, for example that English phonotactics permits syllable-initial clusters of up to three consonants, the first of these always being /s/ (e.g. struc-ture, splen-did), whereas Spanish allows up to two, of which the first cannot be /s/ (e.g. es-truc-tu-ra, es-plen-di-do). General principles of phonology, however, will not predict that the sequence /d/, /o/, /g/ expresses the concept of 'domestic canine', or even that a stress shift in the verb con'vict will convert it into the noun 'convict. This information is idiosyncratic, exceptional, and so must be listed in the lexicon.

Similarly, in the morphological module, the expression of plurality in nouns will be specified as suffixed /s/, but the form of the plural of child must be listed in the lexicon. In the syntactic module, a rule will specify that adjectives in English come before the noun, but the fact that responsible can come after ('The person responsible did not show up') must be listed in the lexicon. It has been argued too that idioms, which are semantically non-analytic, must be listed in the lexicon, in order to explain dual readings in phrases such as 'He kicked the bucket'.

Lexical entries therefore contain a lot more information than standard printed dictionaries. The facts about words listed in (1) represent an estimation of what is involved:

(1) Kinds of Information Represented in Lexical Entries

(a) phonological/orthographic form/s
(b) syntactic category/ies
(c) syntactic subcategory/ies
(d) selectional restrictions
(e) thematic structure
(f) concept/s expressed (i.e. meaning)
(g) association/s with inflected and derived forms
(h) association/s with related entries

The information in (a) represents the physical form(s) of the word, i.e. its canonical form plus lexically conditioned allomorphy; (b) specifies under which nodes it can occur in syntactic trees (some can occur under more

than one, e.g. 'the trees fall' vs. 'the fall of the trees', i.e. under V and N nodes); (c) specifies the range of complements the word can take, e.g. the fact that the verb come does not take a direct object but that the verb comb does (i.e. intransitive vs. transitive); (d) gives information about the semantic/pragmatic nature of the syntactic context in which the word usually occurs, e.g. that murder takes a subject and direct object that are [+human]; (e) explains the role played by arguments of a predicate, e.g. that the verb buy can appear in the thematic grid [‹agent› ____ ‹theme› ‹benefactive›] (as in 'John cooked dinner for his friend'); (f) points to the meaning of the word: this we will return to later; (g) specifies the morphological family[5] of the word, e.g. that murder is related to murdered and that happy is related to unhappy and happiness; finally, (h) represents knowledge of how words are related to other words in various ways, e.g.: (i) similar form (aim ‹-› ail), (ii) related meaning (aim ‹-› shoot), (iii) typical collocations (aim -› at), (iv) similar syntactic characteristics (e.g. aim ‹-› prefer,[6] or (v) more unpredictable individual associations (some-one who habitually uses bottles as targets for their air rifle may plausibly have the association aim ‹-› bottle).

How all this information might be represented or signalled in the Mental Lexicon will be discussed in the following two sections. For now, though, we can conclude that lexical knowledge is extraordinarily rich and diverse, and must be highly structured. The common assumption is that the mental structure used to organise this information is the Lexical Entry, similar to (but much more complex than) entries in a printed dictionary. The Lexical Entry for a word will contain two types of information: (i) representations of knowledge about the word ((1a) to (e)), and (ii)

connections to other representations ((1g) and (h)). The question of meanings ((1f) above) will be put off until section 1.3.

1.2 Form vs. Content

Within the representations listed in lexical entries (as opposed to the information contained in connections), we must make a further fundamental distinction. The information in (1a) concerns the physical shape of words, abstractly representing patterns of energy (acoustic or visual) which determine execution of the relevant motor plans in production and activation of the relevant lexical entries in comprehension. These word forms are connected (arbitrarily) with another set of linguistic-internal representations, those in (1b) to (e), which indicate the structural patterns in which the forms can co-occur with others in a well-formed string; for the moment we shall call this information (linguistic) content, to distinguish it from (linguistic) form. Let us now see how this distinction is motivated in lexical processing - in word recognition (section 1.2.1) and word selection (section 1.2.2).

1.2.1 Form and Content in Word Recognition

Although this distinction between form and content has regularly been glossed over in the processing literature, there is empirical evidence for its reality. In the view of word recognition taken here, as a parallel but modular process, the lexical processor will begin to function as soon as it receives speech input corresponding to a word onset, thus affording the system the rapidity it requires. According to the Cohort Model (e.g. Marslen-Wilson & Tyler, 1980; Marslen-Wilson, 1987), on the basis of the incomplete evidence provided by the word onset, a group of candidate words will become activated, and as more of the word is heard,

mismatching candidates will drop out until only one candidate, generally the right one, will remain. At this point, the word is said to have been recognised and the integration phase can begin. Recognition typically occurs before the whole word has been heard (on average after the first 200 msec of input).

The initially activated pool of candidates is called the word-initial cohort. The cohort is not a theoretical primitive in the model, but rather just a set of activated form representations. Take for example the word trespass (e.g., in the sentence "If you trespass on my land, I'll take a shot at you"); on reception of the first150 milliseconds of input, say the three phonemes /tre/, a cohort will be activated which will contain, for some speakers, the following set of forms:

(2) Word-initial cohort for trespass

treacherous	treble	trench
treachery	trek	trenchant
tread	trellis	trend
treadle	tremble	trepidation
treadmill	tremolo	trespass
treasure	tremor	tress
treasury	tremulous	trestle

Within a few milliseconds from cohort activation, the hearer will receive the /s/, and this will induce all the candidates which do not have a

following /s/ to become deactivated, i.e. to drop out of the cohort. This leaves us with:

(3) trespass trestle tress

On reception of the /p/, only trespass matches and so the other candidates drop out and the word is recognised.

Given prior syntactic or semantic context, the lexical processor can recognise the word even earlier. If the hearer hears:

(4) This is private property. If you tre-...

there is extra information available, compared with hearing the word in isolation as assumed up to this point. Information from the syntactic module tells us that a subject pronoun (you in 4) will probably be immediately followed by a verb, and the collocation private property might facilitate activation of trespass through cross-wiring of lexical entries (provided for in (1h) above). This type of contextual information has the potential to rule out many words, e.g. most nouns, although from our cohort in (2) it will not rule out the verbs tread, trek, tremble or treasure:

(5) (a) If you tread on one square inch...
(b) If you trek across it...
(c) If you tremble at the thought of crossing it...
(d) If you treasure your life...

Marslen-wilson and Tyler's research has consistently shown that the activation of the word-initial cohort on the basis of the sensory input only (i.e. form information) is obligatory, despite the presence of cues from context (i.e. content information) which might rule out some of these forms.[7] For example, Tyler & Wessels (1983) and Tyler (1984), in a series of experiments using the 'gating' technique to assess the contents of the word-initial cohort, found that syntactic/semantic context does not serve to pre-select contextually appropriate candidates, but rather deactivates candidates once the cohort is activated on the basis of bottom-up (form) information only. This strongly implies that form information must be represented independently from content information.

What is first activated in the word recognition process is, then, a series of form representations. Only once the form is activated does the content become available. In the format devised in Hall (1992), we can represent the lexical entry as a pair of form and content representations, as in Fig. 1.

[INSERT FIG. 1 HERE]

In this format, the form representation contains the information in (1a) and the content representation contains all the information from (1b) to (1f).

1.2.2 Form and Content in Word Selection

In production, too, there is evidence for the separate representation and accessing of form and content. Consider malapropisms, a type of speech error whereby a word that sounds like the target but is unrelated in meaning is erroneously produced (cf. e.g. Fay & Cutler, 1977). For example, one might produce equivocal for equivalent, clarity for charity, or maybe tremble for trespass. The occurence of this phenomenon implies that forms are stored and accessed separately from content. However, although there is no connection between the meaning of error and target in the production of malapropisms, there are consistent similarities with respect to another type of content-related information, namely syntactic category and subcategorisation: error and target are almost always both nouns, both verbs, etc. and when verbs, allow the same complements (Fay & Cutler, 1977). Furthermore, Stemberger (1985) has established the pervasiveness of this effect for other types of substitution error.

In the following section we expand the paired representation model to show how the monolithic category content in opposition to form must be divided into two types of information: linguistic vs. non-linguistic. It will be shown that with this division, the structure of both the ML1 and the ML2 becomes much clearer, and many L1 error phenomena, including the behaviour of malapropisms, can be more easily explained.

1.3 Linguistic vs. Non-Linguistic Information

Traditionally, it has been assumed that meaning, ((1f) above) is directly represented as part of the content information listed in lexical entries (as in the paired representation model exemplified in Fig. 1; cf. also

Butterworth, 1983). This is part of a larger problem of distinguishing between purely linguistic knowledge and knowledge which belongs to (or is shared with) other cognitive faculties. The problem is not made any easier by the fact that we are mostly aware or made aware of what we know through language, and so are often prompted to confuse linguistic representations with representations of the concepts which they (arbitrarily) express. What we need to recognise is that although language is our most sophisticated tool for representing, manipulating and communicating knowledge, it is not the only way in which human beings can do this, and so knowledge representation is not identical to linguistic representation. Many people (usually without much thought) assume, on the contrary, that human language is necessarily the language of internal thought as well as the language of external interaction, i.e. that English speakers do all their thinking in English, Spanish speakers in Spanish, Nahuatl speakers in Nahuatl, etc., and that thought without language is impossible.

It would follow naturally from this position that meaning is linguistic, and so should be represented in the Mental Lexicon (which is a module of the linguistic system). This is, in fact, the assumption that most linguists have made. Nevertheless, the evidence to the contrary, that meaning and thought are non-linguistic, is overwhelming, though not immediately apparent. Jackendoff (e.g. 1983) is especially convincing in this regard, and much of what follows is derived from his work.

1.3.1 Language and Thought

A moment's thought should suffice to convince one that not all of the things that we can think about are expressible in language. In the words of Schreuder and Flores d'Arcais (1989, p. 419):

> No language has the words to cover all possible concepts that speakers may want to express. When the lexicon does not provide a term for a given concept related to a situation, an object, or an event, a lexical gap exists. Such gaps can be general in the language (the dictionary does not provide a lexical item) or individual (a person does not know a given word in the language). Momentary lexical gaps may of course also arise for a given speaker when the access to the appropriate term in the mental lexicon is blocked because of memory failure.

In such cases, there is no question of the absence of the relevant conceptual representation. Independent of the existence of a linguistic expression (word or combination of words) in the shared linguistic system or in the minds of individuals, the relevant concept exists and can be thought about. The distinction made in the passage between the language of a group (the vocabulary of which may be (partially) recorded in a dictionary) and a particular speaker's language system, is the same as Chomsky's (1986) distinction between externalised language ('E-language' referring to language in the sense that is usually understood by the layman, as a social system of shared linguistic norms) and internalised language ('I-language', a technical term referring to the mental grammar, different for each individual). The idea of lexical gaps extends further than this, though: there are many things that all humans can experience or think about but

which can be fully represented by no human language, for example pain, love, maths, or artistic creation: Mozart composed his Eine Kleine Nachtmusik without recourse to his language faculty, but would we want to conclude that he did it without thinking? Similarly, when Monet chose the colours for each stroke of his Rouen Cathedral, he was not choosing between the words blue, grey, or cream, and neither was he applying his paintbrush blindly.

Some types of speech error and performance breakdown clearly show the separation of non-linguistic from linguistic representations. Schreuder and Flores d'Arcais' 'momentary lexical gaps', otherwise known as the 'tip-of-the-tongue phenomenon' (e.g. Brown & McNeil, 1966), fall into this category. Such breakdowns occur when speakers have a concept in mind (i.e. a non-linguistic representation) but cannot retrieve the word for it (i.e. the linguistic expression of the concept). How could this occur if we think in language, i.e. if the concept is represented in our minds by the word itself? Similarly, at the clause level, we generally have an event or state in mind as a complex concept before choosing its linguistic expression. Why then do we regularly stop halfway through an utterance and revise our syntactic choices, if the complex concept is represented by a phrase structure tree?

In order to accommodate the language = thought assumption into the broader view furnished by Fodor's (1983) theory of input systems, we would need to settle the question of why the linguistic input system should be privileged in supplying the format for concept representations. Are not the smell, textures and colours of a rose part of the concept 'rose', and is not

the sound and characteristic visual shape of a bell part of the concept of 'bell'? None of this information about particular roses or bells need enter the mind through the linguistic forms rose or bell, but we are obviously still making contact with an internal conceptual representation of roses and bells when we experience them (or pictures of them or whatever).[8]

The obvious conclusion here is that meaning is non-linguistic. The 'meaning' of a word is whatever concept or concepts it is connected with in some area of the mind which is neutral as to which input system is used to access it (cf. Engelkamp, 1983). Similarly, the 'meaning' of a phrase or sentence is whatever complex concept (network of connections between 'simple' concepts) it is connected with in this same neutral area of the mind. The possible nature of this area is the topic of the next section.

1.3.2 Conceptual Structure

The modular input systems (including the five senses and, for humans, language too) are characterised by their 'domain specificity' (Fodor, 1983): each module is sensitive to only certain types of energy patterns received from the environment (e.g. visual, olfactory, tactile, linguistic, etc.), and each operates using a representational format which is not shared with other modules. In addition, modules are not privy to information collected by other modules (in Fodor's terms (p. 64), they are 'informationally encapulated'). This simply means that the smell of a rose in the environment will be processed by the olfactory input system, rather than the visual, or other, input system, since it is the olfactory system which has evolved exclusively to perform this task. The actual processing of the smell

will not be aided by visual input corresponding to a rose, nor even by a printed card reading 'ROSE'. Different sources of information will only become compatible and aid in recognition of environmental stimuli once the input systems have done their job and delivered their analysis to the neutral zone of the mind: the area where meanings are stored.

This area of the mind we shall call the central systems. It is here that our knowledge of the world is stored and higher level mental operations, like inferencing or problem-solving, can operate on it. The central systems contain 'levels of mental representation at which information conveyed by language is compatible with information from other peripheral [input] systems such as vision, nonverbal audition, smell, kinesthesia, and so forth' (Jackendoff, 1987, p.16). It is because of these central system representations that we can talk about what we see (interfacing visual and linguistic information), carry out orders (linguistic information and motor plans), avoid bumping into things (visual information and motor plans), and know that sound and vision occur simultaneously in the same location (auditory and visual information), etc.

Meaning is therefore non-linguistic, and is stored in the central systems in some format akin to what Jackendoff (1983) has called 'Conceptual Structure', a network of representations of what we have perceived in (i.e. know about) the real world, recording all our past and present knowledge of it (the 'projected world'). This knowledge is constantly enriched by linguistic input as well as input from all the other input systems. We know little about the nature of this representational format, but suspect that it is similar to the operating systems used in

computers, and that, unlike the input systems, it is characterised by its high degree of accessibility to conscious control and awareness.

The implication of this for the Mental Lexicon is that the content representations we have been proposing for lexical entries must now be pared down to representations of purely grammatical behaviour, namely categories (1b), (c) and (e); these we shall henceforth call frame representations. For the Mental Lexicon, the specification of meaning, (1d) and (f), now becomes a connection rather than a representation, similar to the categories (g) and (h), but in this case relating lexical entries with one or (usually) more representation(s) in Conceptual Structure. A possible representation of the word trespass, then, will be connected to some concept 'trespass', as in Fig. 2. Note that, in the best comic strip tradition, the progression from concrete form to abstract concept is reflected in this format by a progression from regular rectangle to irregular cloud. This expansion of the paired representation model of Hall (1992) we may call the 'Triad Model' of lexical representation, reflecting the threefold distinction between form, frame, and concept.

[INSERT FIG. 2 HERE]

The linguistic frame representation will contain strictly linguistic information concerning the behaviour of the form in question within the strings of forms in which it can occur. All three representations will be connected interlexically and interconceptually with related representations as specified in (1h), giving rise to a connectionist network, through which

activation spreads (cf. McClelland and Elman, 1986; and Marslen-Wilson, 1989, for the consistency of this perspective with the Cohort Model).

Within the Triad Model, the problem of malapropisms can thus be described as in Fig. 3,[9] where the processor is induced to mis-select due to strong parallel activation at both frame and form levels.

[INSERT FIG. 3 HERE]

If the target is an intransitive verb, like trespass, then all such verbs (i.e. frame representations including the information: V, [__]) become relatively highly activated through frame connections at an initial stage in the selection process, following which the target form also becomes activated, as do all form representations associated with intransitive verbs - but to a lesser extent. Unfortunately, connections at the target form level immediately spread activation to other similar forms (i.e. those sharing the template /treC'CV(C)/), and if selection threshold is erroneously reached in one of the other forms, for example in tremble, already activated by its frame representation, then an error will be produced.

2. The L2 Mental Lexicon

Let us now examine how a model such as this can help us understand the nature of the ML2. We must start with the question of whether the ML2 is really a separate entity from the ML1, or whether they share resources. The available evidence strongly points to the latter hypothesis (especially from studies of bilinguals; see the selection summarised in Meara, 1980).

In the remainder of this paper, I wish to elaborate on this hypothesis and suggest that, in fact, the ML2 is essentially parasitic on the ML1 in the early stages, and although gaining some degree of autonomy later, has no independent existence. I claim that the ML2 constitutes a network of lexical knowledge, tagged for L2 status, which exploits the lexical structure already securely in place in the ML1; in effect, it grows on the ML1 and feeds off it. From the point of view of successful learning (and teaching), this is both a good thing and a bad thing, as we shall see.

2.1 Evidence for the Parasitic Nature of the ML2

There are two types of evidence which lead me to the conclusion that the ML2 is parasitic in nature. The first is from the area of L1 transfer, a pervasive phenomenon in L2 learning, whatever the degree of similarity between source and target language. Basically, transfer in vocabulary learning manifests itself at the form level in the shape of cognates, and at the frame level in placing L2 words in L1 structural configurations. Transfer generally only becomes evident in the form of errors, i.e. negative transfer, or interference, and it is data of this sort that constitutes our strongest source of evidence for the parasitic hypothesis.

A second source of evidence is from general cognitive principles, in the sense of what we know about how the mind is organised and how it deals with new information. Some of the principles have already been introduced in the discussion of the lexical module as part of an 'input system': this perspective allows us to build a model which enjoys much

more generality and theoretical cohesion than hitherto achieved in work on vocabulary learning.

These two sources of evidence, working 'bottom-up' from classroom error phenomena and 'top-down' from theoretical work in cognitive science, are discussed in turn in sections 2.1.2 and 2.1.3, but first we must establish the nature of 'unmarked' vocabulary learning, i.e. the learning of words which have direct translation equivalents in L1, share lexical frames, but have unconnected forms.

2.1.1 Positive Transfer: Translation Equivalents

The effectiveness of positive transfer in the form of translation equivalents (i.e. pairs of L1 and L2 lexical entries which should share an identical concept representation) has received relatively bad press in the pedagogically oriented literature. Meara (1980: 225), for example, criticising mnemonic learning strategies like the 'keyword' technique states that:

> [l]earning vocabulary is not just a matter of acquiring translation equivalents, as it is well known that languages rarely map their lexical items onto each other in a one-to-one fashion.

Gairns & Redman (1986: 30) note that:

> ... many equivalents are only partially synonymous and teachers should be particularly sensitive to these differences if they are using translation in the classroom for vocabulary teaching.

They warn further (p. 75) that:

> [a] ... real danger with translation is that if students continue to use the mother tongue as a framework on which to attach L2 items, they will not develop the necessary framework to take account of sense relations between different items in the new language.

Nation, in a deeper and more stimulating discussion of the problem, begins by warning that '[i]t is unusual for the meaning of a word in one language to correspond exactly to the meaning of its equivalent in another' (Nation, 1990: 40). Unfortunately, in this and other discussions, a failure to recognise the distinction between linguistic and non-linguistic representations confuses the issues. Let us examine the problem in more detail.

In the approach to L2 derived from the Triad Model and the Parasitic Strategy (yet to be motivated), a translation equivalent will be represented by two forms, a single frame representation and a single connection between frame and non-linguistic concept (meaning). I follow Nation in assuming that '[l]earners discover the part of speech [syntactic category] of a word by looking at the part of speech of its mother-tongue translation' (1990: 48), and hence assume that the L1 frame representation is initially assumed to be identical for an L2 translation equivalent. So, for example, a

Spanish-speaking learner of English will assume that dog behaves the same as perro, in that it is a count noun and can appear in the same structural positions in syntactic strings. For this learner, then, the English word dog presents only two tasks: (i) establishing a new form representation, and (ii) establishing the correct connections with ML1 representations, as diagrammed in Fig. 4.[10]

[INSERT FIG. 4 HERE]

The critical point is that no new meanings/concepts are being learnt. This is the norm, even given words with more complicated semantic connections. Nation (1990:30, 53) presents such a case, which I quote here in full, since it illustrates certain problems which are very widespread in the literature:

> ... from the point of view of an Indonesian the word fork is several words: garpu (the fork we eat with), pertigaan or simpang jalan (the fork in the road), cabang (the fork in a tree. In Indonesian it is the same word as branch.).
>
> However from the point of view of the English language, fork is one word. It is possible to describe the meaning of fork so that this meaning includes most uses of the word. Defining a word by looking at the concept that runs through all its uses reduces the number of words to learn. Instead of having to learn three words represented by the form fork, by learning the underlying concept of fork the learners have only one item to learn. There are other reasons for approaching vocabulary learning from this point of view. One of the

> educational values of learning a foreign language is seeing how the foreign language divides up experience in a different way from the mother tongue. From an Indonesian point of view, fork is defined mainly by its function - something to push food onto your spoon. From an English point of view, fork is defined by its shape. Treating meaning in English as if it was just a mirror of the mother tongue hides this difference... (p. 30)

> Fork is a useful English word. Its meaning can be communicated by showing a real fork, showing a picture of a fork, drawing a fork, explaining what a fork is, putting the word in a context, or translating the word into the mother tongue. For the word fork, translation into the mother tongue is unsatisfactory because in most Asian languages the mother-tongue word will refer only to a fork used for eating, and perhaps to the fork of a bicycle. A picture of a fork and a real fork are just as limiting. They will not include a fork in the road or a fork in a branch. Perhaps the most suitable translation for fork is a drawing like this —c . This most closely approximates the idea of a fork that native speakers of English have. Certainly it fits most of the uses of fork in English. (p. 53)

The first problem here is that 'the mother tongue', 'English', 'Indonesian', and similar terms do not refer to the mental grammar of individuals, but rather to abstract social entities - the external semblance of reality reflected by the massive overlap between many mental grammars which make effortless communication between colinguals possible. The 'E-languages' 'Indonesian' or 'English' are very difficult (maybe impossible) to

locate and define in the real world, and it is not at all clear that because such pseudo-entities give the appearance of having 'divided up' experience in a certain way that this will be the way they are divided up within individual minds (i.e. in 'I-languages'). The assignment of words to concepts during language evolution is largely a random process, and in the extension of existing words to new concepts (as in the case of fork), although some features of the conceptual structure associated with the word are picked up at the expense of others (such as physical shape), it is not guaranteed that the process follows the intrinsic salience or organisational prominence of those features in the mind's central systems. So Nation cannot really claim that —< 'most closely approximates the idea of fork that native speakers of English have,' and teaching fork as —< will not necessarily be the best option for Indonesian speakers. This is especially so since most forks for eating have more than two prongs, and yet this is by far the most frequent of the concepts referred to by fork. It is quite likely then that for English speakers, the strongest connection from the lexical entry fork will be to the eating utensil concept, with only weaker, secondary connections with other shape-related concepts (how often do you use fork to describe the branching pattern of a tree?)

What we are dealing with here in fact is a series of concepts (including 'eating utensil', 'fork in road', 'fork-shaped' etc.) connected with a series of lexical entries (including fork, bifurcation, trident, catapult, node, etc. for English and garpu, pertigaan, simpang jalan and cabang, etc. for Indonesian). Virtually all the concepts involved will be shared by both English and Indonesian speakers: we are all humans and a very high degree of the sensory input we receive is universal and is organised in the same

way (this is not to deny socio-cultural differences, merely to put them in perspective). Since the human input systems are part of our genetic inheritance, their structure is as invariable as the structure of human hearts or livers, and so our way of perceiving the world is going to be as highly stable. It follows that languages, too, as expressions of Conceptual Structure (which constitutes a model of the world based on what is perceived through the input systems), will be only minimally variable in their expressional potential.[11] If this were not the case, i.e. if, instead, Conceptual Structure differed drastically from indivivual to individual and if the mapping to our mental grammars differed enormously from language to language, then nearly all human interaction (including cross-linguistic interaction) would be impossible, and learning a second language would be beyond us.

Consequently, the learning of L2 vocabulary can best be viewed as a matter of establishing new linguistic forms and determining the way they are connected with existing frame representations in the ML1 and with representations in Conceptual Structure.

Nation blurs these (essentially straightforward) issues in his discussion. He claims that 'if from an Indonesian point of view, fork is defined mainly by its function'. It is not at all clear whether by 'fork' here he is referring to the concept 'fork', the English word fork, the Indonesian word for the eating utensil (garpu), or something else. In the later passage he points to the use of the mother-tongue word for 'fork of a bicycle', thus belying its restriction to function (at least for some Asian languages); and yet this is the only reading of his statement which makes any sense. The

problem for the Indonesian learner of English is that the word fork has a richer network of connections with Conceptual Structure than the Indonesian word garpu, for it not only expresses the functional concept ('eating utensil'), but also has been extended to concepts which share the feature of similar physical shape. The problem of metaphorical extension is a common one, but should be (more or less easily) surmountable once the shared features are brought to conscious awareness (a strategy Nation endorses). In the early stages of vocabulary learning, the basic translation equivalence fork <--> garpu should be very useful, allowing later enrichment on the basis of further input. We shall return to the pedagogical aspects of this problem later. For now, though, I should just like to suggest that translation equivalence is not necessarily the beast it has been dressed up to be, once it is recognised that, basically, all that is involved at first is learning a new form and making an initial connection to a frame representation already in place.

In any case, in the context of learning as a cognitive process, rather than teaching as an educational process, it seems that we may not have much choice in the matter. Although a lot of learning in L2 is consciously controlled (hence the chasm which separates it from L1 acquisition), much of it will be automatic (especially in immersion scenarios), and certain strategies will be automatically followed, at least for the great majority of beginning learners. Monolingual learners of an L2 will have no expectation that the L2 might divide up experience differently from the L1 (just as different cultural and ethnic groups perceive behaviours and beliefs which do not match their own as unnatural or misguided); hence, they will automatically make connections between L2 input and existing L1

structures, whether the L1 is used to define or translate the L2 word or not (and, as I suggested in the previous paragraph, in the majority of cases the equivalence will be a very close (if incomplete) one). This is because of the way the mind works: it is inevitable, and the fact that learners assume it is reflected in consistent error patterns. In the light of this, Meara's (1980:225) claim in the passage quoted earlier that 'languages rarely map their lexical items onto each other in a a one-to-one fashion', can be seen as a claim about E-language, rather than I-language: languages as social abstractions do not match lexical items one-to-one, but crucially, individual learners do. Some of the evidence will be discussed in the following sections; for now, however, we will assume that translation equivalence is a strategy regularly and automatically employed in the L2 learning process, and leave for later the question of what the teacher should do about it.

This assumption of translation equivalence on the part of the learner does not, of course, imply that every word in L2 will in fact have an equivalent in L1. Nor does this follow from the observation that the expressive content of human languages overlaps to a great extent. There are going to be many cases of 'lexical gaps' in the E-language, in the sense of Schreuder and Flores d'Arcais (1989). In such cases, where no translation equivalent (TE) can be identified by the learner, i.e. where the concept associated with the L2 word has no lexical expression in L1, or where the conceptual overlap does not reach some critical level, then the ML1 will not be involved and connections will have to be made directly with Conceptual Structure, as in the case in Fig. 5.

[INSERT FIG. 5 HERE]

Spanish does not have a direct TE for posh, although Spanish speakers do have the concept (i.e. they know if someone or something is posh or not), and can express it using more than one adjective or some other circumlocution.

If the learner identifies an L1 form which significantly overlaps with the L2 form representation, and in addition is, in fact, a translation equivalent (i.e. is a true cognate), then learning is facilitated due to positive transfer at both form and frame levels. The identification of cognates, both true and false, constitutes a form of transfer. True cognates (for example Eng. cat and Sp. gato) are lexical items which are shared between L1 and L2, as a result of either shared lexical inheritance from a common parent language, or through inter-language borrowing. In true cognates, a form's meaning equivalence has been maintained, historically, between L1 and L2, whereas in false cognates either the meanings have diverged (e.g. Sp. actual 'current' and Eng. actual, from Lat. actualis, 'active, practical') or the items are actually unconnected historically (e.g. Sp. tuna 'prickly pear' and Eng. tuna). In the case of true cognates, learning is typically facilitated, but in false cognates, errors generally result.

Given the learner's assumption of a cognate (which may turn out to be true or false), it is hypothesised that a direct connection is made at the form representation level, as diagrammed in the example of the true cognate in Fig. 6, where (ignoring minor details such as vowel quality) the L1 word gato /gato/, differs only in voicing in the first consonant and the addition of a final vowel from the L2 form cat /kat/.

[INSERT FIG. 6 HERE]

Given this connection, retention of the L2 form (i.e. the representation's achievement of permanence in lexical memory) will require less effort, since much of the form is already in place in the (permanent) ML1. The issue of retention (i.e. memorisation) of forms and connections will be taken up again in section 3.1.[12] We now turn our attention to negative transfer.

2.1.2 Negative transfer: False cognates and the assumption of frame equivalence

In this section we look at cases of interference from the L1 which provide evidence that the ML2 is parasitic, i.e. that it is constructed using the lexical information and structure already in place in the ML1. Let us first look at the phenomenon of false cognates, which is particularly rife between Spanish and English. We can distinguish between two types of false cognate: (i) true false cognates, and (ii) indirect cognates, representing points on a continuum rather than poles. A true false cognate would be Eng. actual for Sp. actual. The former means, roughly, 'real' whereas the latter means, roughly, 'current': although their historic identity may be apparent to linguists, it is not necessarily so to the lay learner. An indirect cognate, on the other hand, shares some feature(s) at Conceptual Structure, of which the learner is consciously aware, for example English library used for Spanish librería, 'bookshop'. Here the overlap is clear: both concepts involve a building containing shelves from which clients take away one or

more books (in the second case, they leave money and do not bring the books back). In Fig. 6 and Fig. 7 these examples are represented, showing both the learner error and the target configuration.

[INSERT FIG. 7 HERE]

[INSERT FIG. 8 HERE]

In essence, learners commit such errors because they are trying to minimise the amount of work they have to do, and maximise their use of structure already established, i.e. entries in the ML1. In other words, they are exploiting the ML1 in parasitic fashion.

Another common error in L2 vocabulary learning is to assume that the L2 form can appear in the same structural configurations (frames) as its TE. The fact that this happens so consistently is testimony to the claim that learners do indeed latch on immediately to TEs. Consider the example in (6), where the learner uses the English put as though it had the same distribution as Spanish poner.

(6) *He put some music

The error is that the lexical entry for put contains the restriction that a location thematic role must be expressed (which would be represented in (e) of the list in (1)). In the lexical entry for poner no such stipulation is made. What is happening is diagrammed in Fig. 9, again showing error and target configurations.

[INSERT FIG. 9 HERE]

Again what we see is an example of a parasitic strategy. If we deny that learners are automatically associating L2 input with L1 representations of form and frame, we cannot explain this pattern of errors which is so common amongst L2 learners. In the next section some motivation for this parasitic strategy from general cognitive principles will be sketched.

2.1.3 General Cognitive Principles

One of the major principles governing mental structures and processes is that of economy. In terms of structure, economy allows finite symbolic inventories and rule systems to be used to generate infinite representational configurations; in terms of process, it allows these representations to be built very rapidly and automatically. What economy means in essence is that humans are lazy: they do not expend any more effort than is absolutely necessary, hence the alternative term 'least effort' for this operating principle.

In theoretical linguistic work on the structure of mental grammar, the principle of economy has been a fundamental consideration (cf. Martinet, 1964), as it is in all theory building (when it is often called parsimony). It is economy that has led, in the generativist research programme, to an increasingly simpler and more general system of principles to define Universal Grammar, the genetic blueprint for language (compare Chomsky, 1957 with Chomsky, 1986, for example; cf. also Chomsky, 1989). Within this tradition, theories of the lexicon embody important elements which ensure economical representational formats, for example Aronoff's (1976) lexical redundancy rules, which relate connected words, like the morphologically derived forms happy <--> happiness, so that the form happy does not have to be listed twice. Similarly, it has been suggested that subcategorisation information ((c) in (1)) is redundant given information about thematic roles ((e) in (1)), from which the syntactic categories of complements can be predicted (cf. Radford 1988:378-384). From the point of view of processing, the economy principle has enjoyed

equal importance. Hall (1992: ch. 5), for example, presents a model of morphologically complex forms which incorporates the redundancy rule insight. In acquisition too, children adopt the most economical and general solutions to problems posed by the input: this is perhaps seen most clearly in the phenomenon of overgeneralisation.

Hence we should not be surprised that L2 learners execute the most economical strategy in their acquisition of vocabulary. Instead of constructing an entirely new knowledge store for the L2, they utilise the store they have already in place. Instead of duplicating information, at the form level with cognates and at the frame level with TEs, they list it only once and attach new L2 forms to existing representations. This process reflects another cognitive principle, this one specifically linked to the acquisition of new information, i.e. learning. The principle is one of accommodation, which means that whenever the mind is presented with new information, it is more easily retained if it is accommodated within existing structures. This is the basis of theories of the connectionist mind (cf. Rumelhart and McClelland, 1986), an approach which has gained great prominence in cognitive science over the past decade, and, in fact, underlies much of the discussion in this paper. Connectionism holds that the mind is basically a vast network of simple processing units, and that complex mental states and behaviour are the result of different configurations of the network (in a similar style as the neurophysiological network of neurons in the brain). Learning then becomes a process of accommodating new units (or new groupings of old units) into the existing network. This is precisely what happens with the parasitic strategy developed here: recall that in this model, vocabulary learning means

establishing new form representations (new units) and connecting them with existing units (accommodating them in the existing network). Hence, some form of parasitic strategy is supported by what we know about cognition in general, and not only by what is observed in the lexical output of L2 learners.

2.2 The Parasitic Strategy

On the basis of the foregoing discussion, therefore, I hypothesise that learners, at least in the initial stages of vocabulary learning, automatically follow a parasitic strategy, according to the following steps:

(7) Parasitic Strategy

On isolating a new L2 word:

1 A form representation for the L2 word is constructed.

2 The existence of a TE is assumed and its lexical entry is located in the ML1.

3 (a) The L2 form representation is connected with the TE form representation if they significantly overlap. If not,
(b) The L2 form representation is connected with the TE frame representation.

4 If no TE is located, a new frame representation is constructed for the L2 word, and is connected with the relevant representation in Conceptual Structure.

5 Given further input which does not match the configuration yielded by steps 1-4, such connections and representations are revised, changing as little as possible, to accommodate the new input.

6 Given firm retention, 3(a) is revised in favour of 3(b).

According to the Parasitic Strategy, the key to learning the word is first to establish a form representation, i.e. learn the pronunciation and/or spelling (step 1), and then to make the right connections (steps 2-6). Step 2 claims that learners will immediately search for a translation equivalent, and this should occur whether the concept is signalled by overt translation into L1, by an L1 or L2 definition, by some icon (e.g. a picture or mime), or by whatever other medium. This is because when language input is received, it is the responsibility of the linguistic module to deal with it, whether it is L1 or L2 input (consistent with Fodor's (1983) 'domain specificity' diagnostic). This we witness in the cognate and L1 usage errors discussed in section 3.1, and it is the basis of the Parasitic Strategy. In Step 3(a), cognates are used initially for economic representation-building and retention, whether the concept at the other end of the triad is the correct one or not, hence the errors resulting from false cognates (e.g. Sp. actual for Eng. actual) and indirect cognates (e.g. Sp. librería for Eng. library). In Step 3(b), TEs are connected at the frame level, although identity at the conceptual level does not guarantee identity of linguistic frame, as evidenced by the occurence of L1 usage errors (e.g. Sp. poner for Eng. put).

If no TE is located, then a new frame representation will need to be constructed and connected with the relevant conceptual representation.

Step 4, I argue, will generally not be needed much in the basic vocabulary stage, and will be followed typically only in cases of accidental gaps like Eng. posh or handout which have no TEs in Spanish and Sp. simpático (roughly 'nice', 'pleasant' and closer to Fr. sypathique or Ger. gemütlich) or prima ('female cousin') which have no TEs in English.[13] In some cases, where cultural/environmental novelties unkown to the learner are involved, then new conceptual representations will also be required (e.g. 'piñata' or 'tortilla' for British learners of Mexican Spanish, and 'scone' (= Amer. Eng. 'biscuit') or 'professor' (= Amer. Eng. 'full professor') for Mexican learners of British English).

For those educationalists who are working through this model and are repressing (or giving voice to) their outrage at the vast oversimplification of the problem that steps 1-3 represent, please bear with me. Step 5 is the crucial step which, throughout the vocabulary learning process, is constantly revising and extending the connections on the basis of further input, just as L1 speakers revise and extend their understanding of L1 words throughout their lives. Hence, Steps 3(a) and 3(b), when leading to errors, will sometimes be corrected at Step 5, but sometimes not. When not, fossilisation is said to have occurred. The model predicts errors, because efficiency (in the sense of economy of time and effort) always leads to errors (as we see in L1 slips of the tongue and ear). But Step 5 gives the process a dynamic aspect, which reflects our knowledge that learners can and do recover from initial errors (as they do in L1 language acquisition, thoughout the process).

Step 6 also reflects this dynamism, allowing for more autonomy in the ML2 once proficiency increases, in this case by replacing the economy of representation effect of cognate form connections with the economy of processing effect of direct frame connections. In other words, although it serves the learner's task in the earlier stages to have the form cat linked to the form gato and thence to the frame representation, this will involve an extra step in the process of recognition and selection (i.e. from L2 form to L1 form and thence to L1 frame, rather than directly from L2 form to L1 frame); so, once retention is firm, the L1 form may be dropped out of the process altogether, leading to increased processing efficiency. Step 6 should be seen as just one instance of later autonomous growth in the ML2, as learners approach the status of bilinguals. There will be a great deal of overlap still, in terms of shared representations, but the processes of learning will lean less heavily on structure in the ML1.

3. Pedagogical Considerations

In this final section I shall make a few suggestions regarding what appear to be some pedagogical implications of this model. The section is short and tentative, since as a theoretician rather than an educationalist I would prefer to leave the task of application to those more qualified than me. The essential insight of the Parasitic Strategy is that L2 learners learn vocabulary by (i) constructing a new form representation and (ii) automatically seeking to connect it to representations in the ML1 in the most economical fashion. As I pointed out in section 2.1.1, the process is automatic, and teachers can do little to halt it. Teachers can, however, guide the process in its two stages by (i) reinforcing the construction of

new form representations and (ii) minimising the fossilisation of erroneous connections with L1. Some thoughts on how this should and should not be done are presented in the following sections.

3.1 The Importance of Form

A clear prediction of the model is that the initial key to vocabulary learning is the construction of a robust form representation, since this is, essentially, the only conscious, substantive learning that needs to occur in the majority of cases: the remainder of the process is a matter of connecting up the new form with an L1 frame representation, which is done automatically (albeit often erroneously, as we have seen) on the basis of the evidence available in the form of of L1 definitions, pictures, context, mime, bilingual or monolingual dictionaries, cognates, etc. Robust form representations will need reinforcement through both speech and writing and production and comprehension, with little explicit guidance as to the full network of connections to L1 in the first instance. This suggests a useful role for the traditional (and currently highly unfashionable) notion of vocabulary lists. Such lists would contain L2 forms paired with TE forms from the L1. The TE selected should be the most frequent or common translation, as in Indonesian garpu for Eng. fork (cf. the discussion in 2.1.1. above). Despite their negative associations (with rote vocabulary exercises in the L1 classroom and with decontextualising, non-communicative teaching strategies in the L2 classroom), vocabulary lists can, I think, serve a useful purpose in the establishment of purely formal aspects of vocabulary learning, i.e. the memorisation of phonological and orthographic forms of new words, for both recognition and production modalities.

3.2 The Role of Translation Equivalents

As I argued in section 2.1.1, the L2 learner will automatically search for a TE in the L1, as a consequence of the way the mind works: individual learners have little reason to believe that a foreign language will express the world differently from the way their own language does, and in fact languages do not differ overwhelmingly in this regard, since we all share the same basic perceptual equipment. If we accept that the search for TEs is inevitable, and that errors resulting from erroneous connections will be equally inevitable, then the use of word lists with TEs that are consciously chosen by teachers will serve a second purpose: not only will they reinforce form representations, but also they will allow the teacher to minimise fossilised errors by influencing the initial connection made with the ML1.

The main objection to the use of translation equivalents has been that they restrict the L2 learner to the L1 semantic framework, as argued by Gairns and Redman (1986) and Nation (1990). As I argued earlier, however, the semantic framework is not within the linguistic module at all, but rather at Conceptual Structure, which is blind to the difference between L1 and L2 input. This point is particularly clearly missed by Nation (1990, p. 62) in the following passage:

> [Definition by translation] may be used to save time, if the concepts in English and the learner's mother tongue are the same. If used very much it will reduce the learner's experience of English in the class, and it will encourage them to make false equations between concepts in English and in their mother tongue.

One can only 'encourage' somebody to do something if it is under their conscious control, and, as I have argued, identifying TEs is not. Concepts are not 'in English' or 'in' any language, other than in the non-linguistic language of the central systems of the mind. Sense relations (i.e. the correct network of connections between Conceptual Structure and the Mental Lexicon) will be developed gradually, on the basis of further input from L2, as L2 entries become more autonomous from L1 entries, i.e. as the ML2 gains a degree of autonomy from the ML1 (as we see in step 6 of the Parasitic Strategy). Thus, at the early stages, guidance as to the closest, most useful TE should not in any way block later expansion and revision of connections with Conceptual Structure. The notion that the L1 should be entirely purged from the L2 classroom goes against all that we know about cognitive representations and processes. The L1 should be viewed as another classroom tool, as a link in the learning chain, rather than an obstacle to be removed.

In this spirit, the model presented in section 2 maintains that the use of cognates to establish and retain L2 form representations is an automatic consequence of the Parasitic Strategy. It follows, therefore, that classroom time on this aspect of transfer would best be spent on explicit demonstration of <u>false</u> and <u>indirect</u> cognates rather than true cognates. Cognates of any of the three varieties (true, false and indirect) will be treated identically by L2 learners at the outset, and the knowledge required to filter out the false and indirect ones can be supplied by the teacher, again perhaps through the use of lists, as well as by later usage in contexts. The teacher can expand lists so that they read something like <u>actual</u> = <u>real</u>

≠ actual' for false cognates and 'librería = bookshop ≈ library' for indirect cognates.[14]

Currently, some textbooks for Spanish learners of English (e.g. Zentella et al., 1982) do explicitly teach strategies for identifying cognates, but generally these involve the identification of cognate prefixes and suffixes, rather than of roots (for example, the fact that Eng. -ity = Sp. -idad, or that Eng. -ion = Sp. -ción). The difference here is that much morphological knowledge is metalinguistic, i.e. lies outside the morphological module and therefore is unavailable to the automatic learning processes which connect L2 root cognates with L1 form representations. For example, the fact that Eng. -ity signifies a noun is probably not something represented in the L1 speaker's morphological module, since it is an unproductive suffix in the language, i.e. is not used to produce or comprehend novel combinations, whereas the suffix -ness, still very much alive in the construction of novel nouns from adjectives, most certainly is listed. English speakers will only 'know' what -ion does because they have consciously noticed it or have been taught it, whereas they will 'know' what -ness does because the knowledge has been unconsciously acquired as part of the acquisition process (cf., for example, Mohanon, 1982, and note 5). Teaching cognate affixes is therefore probably a sensible classroom technique and it in no way contradicts the claim that lexical cognates need little or no explicit instruction: explicit instruction in morphology does appear to be warranted if, as in L1, the automatic learning processes cannot be relied on to pick them out.[15]

3.3 Problems with Context

In most recent discussions of vocabulary learning, great emphasis has been placed on the importance of presenting new words to learners in context, so that L2 'sense relations' may be established from the outset, without 'contamination' from L1 semantic space. As we have seen, however, the involvement of the ML1 seems inevitable, given the burden of evidence supporting the operation of something like the Parasitic Strategy. In any case, the L1 usually gives the right results. Errors will only occur when the transfer turns out to be negative. As I pointed out before, we only tend to notice transfer when it is negative, but it is likely that the amount of positive tranfer, in the form of correct assumptions of basic L1-L2 equivalence, far outweighs the amount of fossilised errors resulting from incorrect assumptions to the same effect. If L2 learners proceeded blindly, without any reliance on their 'wired-in' linguistic resources, the cognitive challenge of learning a foreign language would be far greater than it already is.

Of course, the new vocabulary item must be practised in (at first simple) contexts once it has a robust initial representation and a firm connection with a TE in the ML1: this is essential if the rich network of connections is to be ultimately attained. But there are good reasons for starting with a simple list of L1/L2 pairs, presented in isolation. The first is that initial presentation in context will invariably cause cognitive overload. The connections to be made for many words (especially verbs) are remarkably complex, and immediate presentation of a word in a sentential or situational context confronts the learner with a much larger set of connections to be made than presentation in a list. Given the normal

contents of a lexical entry as given in (1) above, presentation in lists provides data only for (a), the physical form: the rest is given by the TE, even if it will require fine-tuning at a later stage. Initial presentation out of context means that the learning of syntactic behaviour can be postponed. Immediate presentation in context, however, forces the learner to confront the fine-tuning problem at the outset, i.e. to fix potential mismatches between the L2 usage and the TE frame information contained in (1b) to (h) at the same time as establishing the form of the word. The identification of mismatches, or even just the confirmation that the new form's behaviour is identical to its TE, will inevitably place extra computational demands on the learner, whereas list learning including a basic connection to the ML2 with subsequent revision of errors, should be much less costly.

A second important consideration is that context is inevitably only partial, providing connections with Conceptual Structure for specific instances of use. It is naturally harder to generalise meanings and usages from such particular, incomplete contexts, since the basic, minimal aspects of word meaning are not separated out from the aspects of meaning imposed by the particular context. Johnson-Laird (1987, p. 197) makes an interesting observation in this regard:

> All open-class words, such as "fish" and "eat", are closer to being pronouns than is commonly recognized: they provide a relatively simple semantic framework that can be enriched by inferences based on knowledge. These inferences concern the situation designated by the sentence, and different linguistic contexts highlight different aspects of lexical meaning.

It follows that initial parsimony with regard to potential connections (i.e. those imposed by specific linguistic and non-linguistic contexts) will facilitate later expansion of the network. In other words, less structure will need less revision. Presentation in lists gives the minimum amount of new structure and the most basic connection with the ML1, thus providing the learner with a familiar route to Conceptual Structure, a much stronger position from which generalisations and idiosyncracies can be built into the system.

4. Conclusion

The pedagogical implications I have drawn in the previous section are obviously not the only ones derivable from the Parasitic Strategy model. They are intended as stimuli for further research and as an impulse for the reanalysis of the role of vocabulary and rote learning in the classroom, rather than as dogmatic assertions of good classroom practice. It is my hope that this discussion will encourage L2 researchers to reassess the problem of vocabulary learning with more sensitivity to what we know about the cognitive events involved in the process, so that we will be able to both assist language educators and students and at the same time come closer to an understanding of the rich tapestry of the human mind.

Notes

[1] The earliest version of this paper was presented at the XVIII MEXTESOL National Convention, held in Guadalajara in November 1991; the theoretical aspects of the model were presented at the Coloquio Jakobson, held at the Escuela Nacional de Antropología e Historia in Mexico City in July 1992, and the pedagogical aspects at the VII Encuentro Nacional de Profesores de Lenguas held at the Universidad Nacional Autonoma de México in September 1992. This ongoing research is supported by a grant from the Instituto de Estudios Avanzados at the Universidad de las Américas, Puebla. I gratefully acknowledge the helpful comments made by my colleagues at the UDLA, especially Roberta Friedman, Roberto Herrera, Tom Hunsberger, Rosa Moraschi, Patrick Smith, and Elena Tanner.

[2] Indeed, in Chomsky's conceptualisation (e.g. Chomsky, 1986), it is precisely vocabulary, being the most arbitrary aspect of language, which determines the major differences between particular languages. For him, languages differ very little in terms of grammatical options, which derive from limited parametrical variation in the principles of Universal Grammar (UG): the child is born with UG, and the task of working out which language he or she is being exposed to (and must therefore learn) involves the automatic setting of parameters on the basis of triggers in the input, plus the more laborious task of constructing lexical entries. Of course, learning a second language is not just a matter of learning a new vocabulary, since new grammatical options will also need to be learnt (whether they are

parametrically determined or not), but the centrality of vocabulary cannot and should not be ignored.

3 Perhaps: cf. Lieber, 1992, where it is argued that knowledge of morphology can be accounted for entirely within the syntactic module.

4 This general approach in L2 research has been pursued with more vigour in the area of syntax: I have in mind particularly the attempts of Flynn and her associates to extend to L2 Chomsky's notion of parametric variation (e.g. Flynn, 1988).

5 Only for productive derivations, i.e. when the family relationship is part of the speaker's morphological competence (i.e. part of the morphological module, as opposed to being etymological, metalinguistic information learned through conscious effort): the historical fact that prince and principle are related morphologically may not be represented in the Mental Lexicon, even if the speaker has been taught it or can work it out.

6 Both can take infinitival complements introduced by for: 'She aimed/preferred for him to arrive after lunch' (example from Radford, 1988).

7 This strongly suggests the modular status of the acoustic processor, according to Fodor's (1983) diagnostic of 'informational encapsulation'.

[8] Cf. Bickerton (1990), who, in an otherwise intriguing and useful study of language evolution, betrays a fundamental misunderstanding of the relationship between language and cognition in assuming that 'language = thought', claiming (p. 225) that: 'Everything accessible to the conscious mind [can] be - and not only [can] be, but [has] to be - assigned some form of linguistic label." Of the Mental Lexicon he states: 'There can be little doubt that this enormously efficient filing system, organizing as it does our entire knowledge of the world, forms one of the major factors in our success as a species.' (p. 43). Whilst concurring with the general claim, I would take issue with his assumption that the Lexicon 'organises' our 'entire' knowledge of the world - this job, as I argue in the text, corresponding to Central Systems rather than the Linguistic Module.

[9] The exact nature of the frame representation is still unclear. For example, it has been suggested that subcategorial information is redundant, given the contents of the thematic grid (cf. 2.1.3). I therefore represent frame information using the notational soft option of upper case letters.

[10] For the sake of simplicity, the lexical entry box will henceforth be omitted. L2 representations are indicated with boken lines.

[11] The significance of so-called strong 'Whorfian' phenomena, where the form of language is said to have determined important aspects of Weltanschauung, has been grossly exaggerated in my estimation.

[12] The question of whether L2 cognate forms are represented separately from their L1 pairs, as diagrammed in Fig. 6, or are represented via phonological rules which derive them from their pairs, is beyond the scope of this paper. It is, however, an interesting question which requires further research.

[13] Such L2 entries potentially lead to borrowing, i.e. the 'L2' tag is lost from the entry and the form representation becomes subject to the constraints of the L1 phonological module, as has, in fact, happened with the English examples cited in the text.

[14] Special thanks are due to my colleague Patrick Smith for helping me see the pedagogical implications of this aspect of the model (although this does not imply that he agrees with the conclusions I have reached).

[15] The problem of learning morphologically complex words is the subject of a second stage in this research project.

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Figures

Fig. 1 Lexical Entry as Paired Form and Content Representations

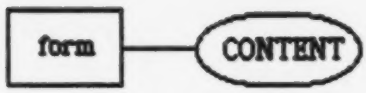


Fig. 2 The 'Triad Model' of Lexical Representation

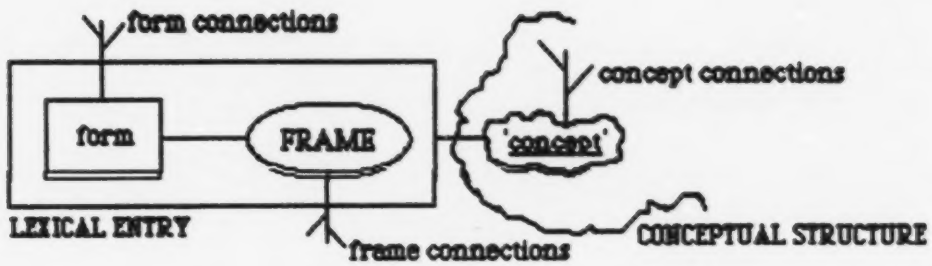
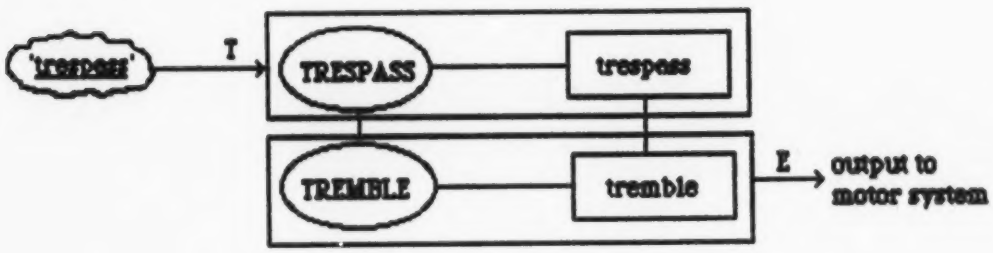


Fig. 3 Malapropisms in the Triad Model



T = target E = error

Fig. 4 Translation Equivalent: Different Form, Same Frame

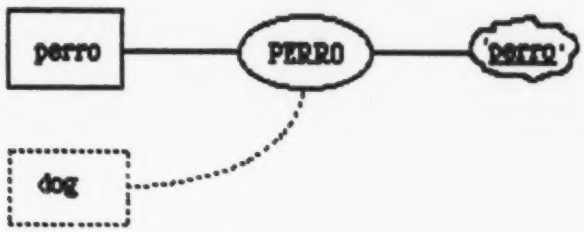


Fig. 5 No Translation Equivalent: New Form, New Frame

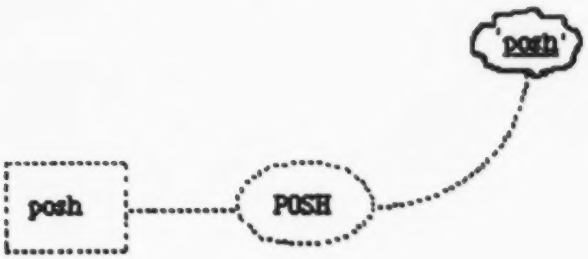


Fig. 6 True Cognate: Similar Form, Same Frame

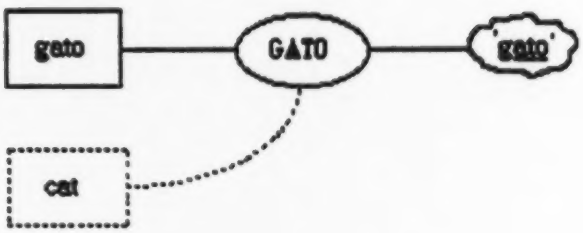


Fig. 7 False Cognate: Similar Form, Different Concept

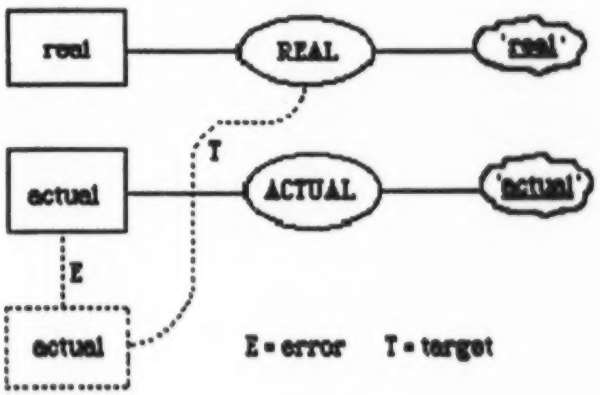


Fig. 8 Indirect Cognate: Similar Form, Similar Concept

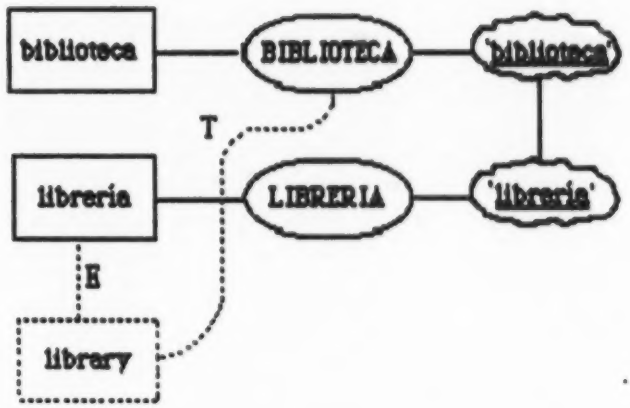


Fig. 9 Near Content Equivalent: Different Form, Similar Content